

## Posterior tibial slope measurement with 5 different methods

YOUNG-JIN PARK, Se-Han Jung<sup>1</sup>, Min Jung<sup>1</sup>, Kwangho Chung<sup>1</sup>, Hyun-Soo Moon, Sung-Hwan Kim<sup>2</sup>

<sup>1</sup>Yonsei University College of Medicine, <sup>2</sup>Gangnam Severance Hospital, Yonsei University Coll

### INTRODUCTION:

Posterior tibial slope (PTS) is an important anatomical parameter in the orthopaedic surgery related to knee. Anterior cruciate ligament (ACL) plays a role in establishing anterior stability of knee as it resists the anterior tibial shear forces across the knee. It is essential to precisely measure PTS to evaluate the prognosis of ACL reconstruction. It is our purpose to compare PTS measurement methods including lateral radiographs of knee, long lateral radiographs of knee, MRIs, 3D-reconstructed CT images in order to compare and assess clinical significance of each method.

### METHODS:

32 patients who were diagnosed exclusively with anterior cruciate ligament injury and underwent ACL reconstruction with required knee images from March 2020 to September 2023 (lateral radiographs of knee, long lateral radiographs of knee, MRIs, 3D-reconstructed CT images) were included for measurements. Proximal anatomical axis (PAA) was used for measurement for lateral radiographs of knee and (AA) was used for long lateral radiographs of knee as a longitudinal component. Mechanical axis (MA) was used the measurement for long lateral radiographs of knee and 3D-reconstructed CT images as a longitudinal component. MRI measurement used a longitudinal axis that is defined by a line that connects the centers of circles that fill the diameter of the tibia.

### RESULTS:

The lateral and medial posterior tibial slopes were significantly different in 4 methods ( $P<0.05$ ). Lateral radiographs of knee using PAA, long lateral radiographs of knee using AA, Long lateral radiographs of knee using MA, MRIs, 3D-reconstructed CT images using MA yielded mean measurements of  $10.1^{\circ}\pm 2.8$  and  $9.6^{\circ}\pm 2.7$ ,  $12.8^{\circ}\pm 3.3$  and  $12.0^{\circ}\pm 3.3$ ,  $10.8^{\circ}\pm 3.0$  and  $10.0^{\circ}\pm 3.0$ ,  $4.8^{\circ}\pm 2.0$  and  $3.9^{\circ}\pm 1.8$ ,  $8.1^{\circ}\pm 2.1$  and  $6.7^{\circ}\pm 2.3$  (lateral PTS and medial PTS, respectively). The order of greatest measurement value is long lateral radiographs of knee using MA, long lateral radiographs of knee using AA, lateral radiographs of knee using PAA, long lateral radiographs of knee using AA, 3D-reconstructed CT images using MA and MRIs. Measurement methods excluding 3D-reconstructed CT images using MA presented with significant correlation with each other ( $P<0.01$ ). Especially, lateral radiographs of knee and long lateral radiographs of knee using AA had significantly high correlation with Pearson's correlation coefficient of greater than 0.8 for both medial and lateral PTS ( $P<0.05$ ), and no significant difference on ipsilateral side measurements. Otherwise, there were significant differences in measurements of ipsilateral sides between different methods ( $P<0.05$ ). All methods had significant intra-methodological correlation between medial and lateral PTS. ( $P<0.05$ )

### DISCUSSION AND CONCLUSION:

Posterior tibial slope measurement methods are highly heterogeneous in terms of yielded mean measurement values. Anatomical reflection on methodological differences are yet to be more considered for each method. Care must be taken when using each of the method ahead of clinical evaluation regarding PTS as a crucial factor.